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High-risk fertility practices and associated factors among reproductive age women in North Shoa Zone, Central Ethiopia

Abstract

Introduction: High rates of maternal high-risk fertility behavior have various inimical repercussions for both the mother and the child. The magnitude of high-risk fertility behavior in Ethiopia exhibited a gradual decline despite the government's efforts to increase access to high-quality family planning services. This study, therefore, aimed to assess maternal high-risk fertility behavior and associated factors among women of reproductive age in North Shoa Zone, Oromia, Central Ethiopia, 2024. Assessing the drivers of high-risk fertility behavior and addressing them through focused prevention initiatives will eventually help reduce mother and newborn mortality and morbidity.

Methods: A community-based cross-sectional study was carried out in selected kebeles in the North Shoa Zone between May 15 and June 15, 2024, with 608 women of reproductive age selected by systematic sampling. The statistical software STATA version 17 was applied for analysis. Bivariable and multivariable logistic regression were fitted. The adjusted odds ratio with its 95% confidence interval was applied.

Result: The practice of high-risk fertility behavior was established to be 62.7% (58.7, 66.6). Mothers with no formal education (AOR = 4.65; 95% CI: 2.46, 8.78; P = 0.001), primary education (AOR = 2.09; 95% CI: 1.29, 3.38; P = 0.003), multiple gestation (AOR = 3.22; 95% CI: 1.33, 7.80; P = 0.009), unwanted pregnancies (AOR = 2.44; 95% CI: 1.01, 5.87; P = 0.047), stillbirth history (AOR = 3.20; 95% CI: 1.55, 6.63; P = 0.002), and non-autonomy regarding household decisions (AOR = 1.68; 95% CI: 1.11, 2.55; P = 0.014) were the predictors that were independently linked with the high-risk fertility actions.

Conclusion: The maternal high-risk fertility behavior reported in this study is comparable to previous studies. Healthcare providers are urged to give more emphasis to those women who endured stillbirth as they require psychological reassurance, extensive counseling, including their families, and follow-up to reduce the emotional trauma, and ease the pressure they may face from the society. Programs and interventions on women of reproductive age with a focus on championing women education and enhancing women's decision making abilities are largely recommended.

Keywords: high-risk fertility behavior, women of reproductive-age, North Shoa, Ethiopia

Volume 16 Issue 1 - 2026

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Received: December 31, 2025 | **Published:** March 25, 2026

Abbreviations: ANC, antenatal care; AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio; DHS, demographic and health survey; EDHS, Ethiopian demographic and health survey; HEWs, health extension workers; HRFB, high-risk fertility behavior; SDGs, sustainable development goals; VIF, variance inflation factor

Introduction

Infants' and children's survival and well-being are influenced by the biological and demographic characteristics of their mothers. These traits also increase the likelihood of health issues for mothers. One of the bio-demographic risk factors that could affect the health of both the mother and the child is maternal high-risk fertility behavior (HRFB), which typically manifests as having too many births, too early or too late maternal age at delivery, and closely spaced births.[1,2] Reducing mother and infant mortality requires addressing a number of issues, including high-risk fertility.[2] In addition to changing the desired rate of population growth, it worsens the good of mothers and children by affecting their physiological capacity and nutritional status, resulting in illness and sibling rivalry.[3] The presence of indeed a single HRFB factor, alone, or in combination, significantly increased the threat of under-five mortality.[4]

The global burden of high-risk fertility behavior remained unknown. In Bangladesh, it was discovered that 67.7% of women of reproductive age engaged in high-risk fertility behavior.[2] The Democratic Republic of the Congo reportedly had a rate as high as 68.5%.[5] According to a study in East African nations, 57.6% of women engaged in at least one high-risk fertility behavior.[6] In Ethiopia, the prevalence of high-risk fertility behavior was found to be 76.90%. Moreover, a significant variation in the prevalence of high-risk fertility behavior was observed amongst regions in Ethiopia.[7]

High rates of maternal HRFB have a variety of inimical repercussions for both the mother and the child. Short birth spacing is associated with the higher threat of motherly morbidities, poor maternal nutritive status, low birth weight, preterm birth, neonatal mortality, and childhood morbidity.[2,8–10] A high level of parity was also established to have positive association with low birth weight, childhood morbidity, child and motherly undernutrition.[1,2,9–11] Childbearing at an early age (< 18 years) is connected to a growing risk of intrauterine growth restriction, preterm birth, neonatal mortality, child undernutrition, hypertension, pregnancy related complications, higher rates of caesarean and operative deliveries and unsafe abortions.[2,10,12] On the other hand, late motherhood (> 34 years)

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has a positive association with preterm delivery, low birth weight, perinatal death, amniotic fluid embolism, chromosomal abnormalities and cesarean section.[1,2,11,12]

Various previous studies conducted around the world established that factors like the mother's age, religion, level of education, partner's education, marital status, wealth index, place of residence, history of child loss, prenatal care, institutional delivery, unintended gestation, history of abortion, and use of family planning were associated with HRFB.[5,7,11]

Since 2004, the Ethiopian government has been executing the "Health Extension Program" to enhance access to family planning and maternal health care services by deploying at least two health extension workers in each rural village.[13] Moreover, the government has been working to expand the availability of high-quality family planning services by enhancing the counseling expertise of healthcare professionals, and reach out to populations with special needs.[13] Despite these efforts, the magnitude of high-risk fertility actions in the nation showed a slow decline from 76.9% in 2016 to 73.5% in 2019.[7,11]

Although several studies have explored specific risk factors in Ethiopia, such as teenage pregnancy, high birth order, and short birth intervals, there is a deficit of literature that has examined all the factors that contribute to HRFB. Even though some studies on HRFB in Ethiopia have been conducted using secondary data, assessing the determinants of high-risk fertility behavior using primary data is pivotal for delivering richer and updated information demanded to develop targeted prevention programs for the region. As far as the authors are aware, not much is known about the variables influencing high-risk fertility behavior in the study area. Therefore, the end of this study was to assess the prevalence of maternal HRFB and associated factors among women of reproductive age in the North Shoa Zone, Ethiopia.

Methods and materials

Study area and period

This study was conducted at selected kebeles in the North Shoa Zone of Ethiopia's Oromia regional state between May 15 and June 15, 2024. Sixteen districts and two town administrations make up the zone's administrative division, with Fitche town serving as its administrative hub. An estimated 2,054,435 people lived in the zone in 2017; 1,023,628 of them were male and 1,030,807 were female.[14] According to the North Shoa Zone health information management system's recent report, there were seven public hospitals, 63 health centers, and 268 health posts. These Health facilities provide multidimensional healthcare services for the catchment's area population.

Study design

A community-based cross-sectional study was conducted.

Population

Source population

All women of reproductive age (15–49 years) who reside in the North Shoa Zone.

Study population

Women of reproductive age (15–49 years) who reside in the selected kebeles and meet the prerequisites for inclusion.

Eligibility criteria

Inclusion criteria

Women of reproductive age (15–49 years) who had at least once gone through childbirth in the previous five years were included. The index child was the youngest child.

Exclusion criteria

Women of reproductive age (15–49 years) who can't respond to the interview due to severe illness during data collection were ruled out from the study.

Sample size determination and sampling technique

Sample size determination

The factual sample size for the study was determined considering the following assumptions: level of confidence was taken to be 95% with $\alpha = 0.05$ value (which yields $Z\ \alpha/2 = 1.96$ on the standard normal distribution curve), a 5% margin of error ($d = 0.05$) and a proportion of reproductive-age women who had at least one HRFB of 60.3% from a study in Hadiya Zone, Ethiopia.[9] Based on this assumption, the actual sample size for the study was computed using single population proportion formula as indicated below.

$$n = \frac{(Z\alpha/2)^2 \times p(1-p)}{d^2} \quad \text{.....(1)}$$

$$n = \frac{(1.96)^2 \times 0.603 \times 0.397}{(0.05)^2} = 368$$

After applying a design effect of 1.5, the sample size turned to be 552. The final sample size for the first objective was 608 after considering a non-response rate. Taking into account a non-response rate, and applying a design effect of 1.5, the sample size calculated for the second objective using residency, ANC use, and type of child birth as predictor variables from prior studies revealed sample size of 548, 317, and 410, respectively. Therefore, the larger sample size, which is 608, obtained from the first objective was considered the final sample size for this study.

Sampling procedure

A multistage sampling technique was used. Out of 18 woredas and town administration six of them (Kuyu, Wara Jarso, Debre Libanos, Sululta, Kimbibit and Wacale) were named by a simple random sampling technique using the lottery method and simple random sampling was again employed to select kebeles from each of the named woredas. The sample size was proportionally allocated depending on the total number of households with eligible reproductive-age women in each of the selected kebeles. Then, systematic random sampling was employed to select the households where reproductive age women reside from each kebele. In cases of household with more than one eligible respondent, only one respondent was named by using a lottery method. The interviewers revisited the households where women of reproductive age were not present, but it was known that there were women who qualified for the study. They did this three times, and if they were unable to meet the women, they moved on to the next household in a clockwise manner.

Study variables

Dependent variable

The outcome variable for this study was maternal high-risk fertility behavior, which is developed using the definition of the Demographic and Health Survey.[15]

Citation: Oyato BT, Abasimel HZ, Zewude BM, et al. High-risk fertility practices and associated factors among reproductive age women in North Shoa Zone, Central Ethiopia. *J Pediatr Neonatal Care*. 2026;16(1):30–37. DOI: 10.15406/jpnc.2026.16.00615

Independent variables

Based on different literature, independent variables for this study were socio-demographic characteristics such as age, religion, educational level, household income, media access and residence, and reproductive characteristics such as contraceptive use, wanted pregnancy, ANC follow-up and place of delivery, child factors such as sex of a child and history of child loss.[2,5,7,11]

Operational definition

High risk fertility behavior: A woman is considered to have high-risk fertility behavior under the following circumstances: age at birth below 18 years or above 34 years; birth order of the most recent child > 3; birth spacing of less than 24 months for the recent child born.[15] High-risk fertility action was identified by the existence of any one of the four previously mentioned conditions (coded as 1 and else 0). These actions were further operationalized as a single high-risk action versus none and multiple high-risk actions versus none.

Women's autonomy index: The women's autonomy index was assessed by asking questions about who in the household makes decisions regarding maternal healthcare, large household purchases, visiting family and relatives, and child healthcare.[9] For each of the four questions, a respondent received 1 point if she was involved in the decision and 0 points if she was not. These points will be summed to yield total scores from 0 to 4. Individual respondents' score was obtained by dividing the score by the maximum score that is 4. A score >/= 0.5 was considered autonomous.

Data collection tools and procedure

The data were gathered via a four-part semi-structured face-to-face interview administered questionnaire. The questionnaire assessed every participant regarding socio-demographic factors, reproductive health traits, high-risk fertility behaviors, child health, and aspects connected to the health care system. The questionnaire was developed after a thorough review of related literature.[2,5,7,11] Six trained midwives and nurses collected the data under close supervision and facilitation by the researchers.

The interview took place at the study participant's home or place of residence after they had given their informed consent. The interview was conducted once the participants completed the task they were working on. If it was known that there were eligible women of reproductive age living in a household but they weren't there when the data was being collected, the interviewers made three separate visits before making any decision.

Data quality assurance and control

The questionnaire and consent documents were first developed in English, and it were translated into local languages, and then retranslated into English in collaboration with a translation expert to ensure consistency, and make it easier to communicate with participants. A pre-test of the questionnaire was carried out in 5% of the sample at Degem Town, North Shoa Zone. Supervisors assessed the clarity, understandability, completeness of questions. A week before the actual data collection time, the data collectors received training. At each site, Interviewers were closely monitored and meetings were held between the data collectors and the supervisors. The collected data were reviewed and checked for consistency and completeness before data entry.

Data processing and analysis

Data was cleaned, checked, coded, and entered into Epi Info version 3.1 then it was exported to STATA version 17 for analysis. Frequencies, proportions, and measures of variation were used to describe the study population concerning socio-demographic and other relevant variables. The overall magnitude of high-risk fertility behavior was estimated with the 95 percent Confidence Interval (CI).

Women who reported to have any of the four conditions of HRFB (age at birth <18 or >34 years; birth spacing < 24 months; birth order of the child > 3) were categorized as having HRFB ("Yes"). Those who did not meet any of these criteria were categorized as having no HRFB ("No"). Binary logistic regression analysis was, therefore, employed to identify factors associated with the dependent variable. Bivariable logistic regressions were used to see the association between each independent variable and the outcome variable and a p value of <0.25 was used to recruit variables for the final multivariable logistic regression model. Then, by applying a "stepwise backward" variable selection technique, to minimize confounders in the model, the final multivariable binary logistic regression model was built. Model fitness for the final model was checked using the Hosmer and Lemeshow goodness of fit test. Multi co-linearity test was carried out to see the correlation between independent variables by using collinearity statistics. Adjusted Odds Ratio (AOR) with a 95% Confidence Interval (CI) in the multivariable model was used to declare statistically significant associations with the outcome variable.

Result

Socio-demographic characteristics

A total of 601 study participants (mother–child pairs) were included in the analysis, giving a response rate of 98.8%. The mean age of participant mothers was 31.3 years±5.4. The majority of participant mothers were in the age group 25–34 years (60.7%) and nearly three-fifths of them were urban residents (58.9%). Nearly three- fifths of the participant mothers (58.9%) were housewives in their occupation whereas slightly higher one-thirds of their partners (36.2%) were farmers. Most of the participants (70.4%) had media exposure and radio was the most common media. More than two-fifths (43.8%) of the participants mothers had a family size of six or more. One hundred ten (18.3%) mothers were the head of the household, of whom 72.7% experienced high-risk fertility behavior (Table 1).

Reproductive health characteristics

More than two-fifths (46.6%) of participants had two or more alive children at the time data collection. Most of the participants (77.0%) had received ANC service for their index child, of whom three-fifths (60.9%) had a minimum of four ANC contacts. One eighty one of the mothers gave birth at a home, of whom 77.3% experienced high-risk fertility behavior. Only one-tenth of the participants (9.8%) gave birth via cesarean section. The proportion of mothers who ever gave stillbirth was 11.1% and 62.4% of mothers used contraceptives before their last pregnancy. Two-seventh of the participant mothers (28.1%) had postnatal care follow-up for their index birth and 58.6% of mothers had planned and wanted index pregnancy. More than half (56.4%) of participant mothers were non-autonomous regarding household decisions, of whom 65.8% entertained high-risk fertility behavior. Multiple pregnancy was only noted in 6% of participant mothers (Table 2).

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Table 1 Socio-demographic characteristics of study participants in North Shoa Zone, Central Ethiopia, 2024

Covariates	Categories	HRFB		Total N (%)
		Yes N (%)	No N (%)	
Maternal age	25-34 years	193 (52.9)	172 (47.1)	365 (60.7)
	<25 years	17 (29.8)	40 (70.2)	57 (9.5)
	≥35 years	167 (93.3)	12 (6.7)	179 (29.8)
Residency	Urban	202 (57.1)	152 (42.9)	354(58.9)
	Rural	175 (70.9)	72 (29.1)	247(41.1)
Marital status	Married / Cohabited	332 (61.1)	211 (38.9)	543(90.3)
	Single	45 (77.6)	13 (22.4)	58 (0.7)
Maternal education	Secondary or higher education	122 (49.4)	125 (50.6)	247 (41.1)
	No formal education	150 (77.7)	43 (22.3)	193 (32.1)
	Primary education	105 (65.2)	56 (34.8)	161 (26.8)
Partner education (596)	Secondary or higher education	186 (53.6)	161 (46.4)	347 (58.2)
	No formal education	120 (86.3)	19 (13.7)	139 (23.3)
	Primary education	68 (61.8)	42 (38.2)	110 (18.5)
Maternal occupation	Housewife	226 (63.8)	128 (36.2)	354 (58.9)
	Merchant	56 (66.7)	28 (33.3)	84 (14.0)
	Government employed	41 (51.3)	39 (48.7)	80 (13.3)
	Private employed	45 (63.4)	26 (36.6)	71 (11.8)
	Other	9 (75.0)	3 (25.0)	12 (2.0)
Partner occupation (596)	Farmer	161 (74.5)	55 (25.5)	216(36.2)
	Daily laborer	26 (47.3)	29 (52.7)	55(9.2)
	Government employed	55 (42.6)	74 (57.4)	129(21.7)
	Private employed	41 (68.3)	19 (31.7)	60 (10.1)
	Merchant	91 (66.9)	45 (33.1)	136 (22.8)
Household head	Herself	80 (72.7)	30 (27.3)	110 (18.3)
	Others	297(60.5)	194 (39.5)	491 (81.7)
Media exposure	Yes	239 (56.5)	184 (43.5)	423 (70.4)
	No	138 (77.5)	40 (22.5)	178(29.6)

Notes: HRFB, high-risk fertility behavior

Table 2 Reproductive health-related factors of study participants in North Shoa Zone, Central Ethiopia, 2024

Variables	Categories	HRFB		Total N (%)
		Yes N (%)	No N (%)	
Age at marriage	20 or higher years	196 (56.7)	150 (43.3)	346 (57.6)
	<20 years	181 (71.0)	74 (29.0)	255 (42.4)
Age at first birth	20 or higher years	270 (57.4)	200 (42.6)	470 (78.2)
	<20 years	107 (81.7)	24 (18.3)	131 (21.8)
Sex of the child	Female	215 (64.8)	117 (35.2)	332 (55.2)
	Male	162 (60.2)	107 (39.8)	269 (44.8)
ANC use	Yes	265 (57.2)	112 (42.8)	463 (77.0)
	No	112 (81.2)	26 (18.8)	138 (33.0)
Delivery place	Health institution	237 (56.4)	183 (43.6)	420 (69.9)
	Home	140 (77.3)	41 (22.7)	181 (30.1)
Current contraceptive use	Yes	213 (57.4)	158 (42.6)	371 (61.7)
	No	164 (71.3)	66 (28.7)	230 (38.3)
Pregnancy intention of the index child	Planned and wanted	183 (52.0)	169 (48.0)	352 (58.6)
	Unplanned and wanted	132 (73.7)	47 (26.3)	179 (29.8)
	Unplanned and unwanted	62 (88.6)	8 (11.4)	70 (11.6)
PNC use	Yes	88 (52.1)	81 (47.9)	169 (28.1)
	No	289 (66.9)	143 (33.1)	432 (71.9)
Stillbirth history	Yes	51 (76.1)	16 (23.9)	67 (11.1)
	No	326 (61.0)	208 (39.0)	534 (88.9)
Women autonomy	Autonomous	154 (58.8)	108 (41.2)	262 (43.6)
	Non-autonomous	223 (65.8)	116 (34.2)	339 (56.4)

Notes: ANC, antenatal care; HRFB, high-risk fertility behavior; PNC, postnatal care

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Maternal high-risk fertility behavior

The overall prevalence of high-risk fertility behavior among women of reproductive age in the current study was 62.7% (95% CI: 58.7, 66.6). Of those women, 27.9% engaged in multiple high-risk fertility behaviors, and 34.8% engaged in only one (Figure 1). Of the women who practiced high-risk fertility behavior, 75.1% gave birth to more than three children; 48.3% had a short birth interval (less than 24 months); 28.1% and 1.1% gave birth older than 34 years and younger than 18 years old, respectively. Birth order greater than three (47.1%) was the most frequently noted high-risk fertility behavior among all women of reproductive age (Table 3).

Table 3 Maternal high-risk fertility behavior among study participants in North Shoa Zone, Central Ethiopia, 2024

HRFB	Risk category	Frequency (N)	Percent (%)
Maternal HRFB	No	224	37.3
	Yes	377	62.7
Any avoidable maternal HRFB (n=377)	Age at birth < 18 years	4	1.1
	Age at birth > 34 years	106	28.1
	Birth interval < 24 months	182	48.3
	Birth order > 3	283	75.1
Single-risk category (n=209)	Age at birth < 18 years	4	1.9
	Age at birth above 34 years	7	3.3
	Birth interval of < 24 months	83	39.7
	Birth order > 3	115	55.0
Multiple high-risk category (n=168)	Age < 18 or above 34 years & Birth order > 3	69	41.1
	Birth interval < 24 months & Birth order > 3	69	41.1
	Age < 18 or above 34 years & Birth interval < 24 months & Birth order > 3	30	17.8

Notes: HRFB, high-risk fertility behavior

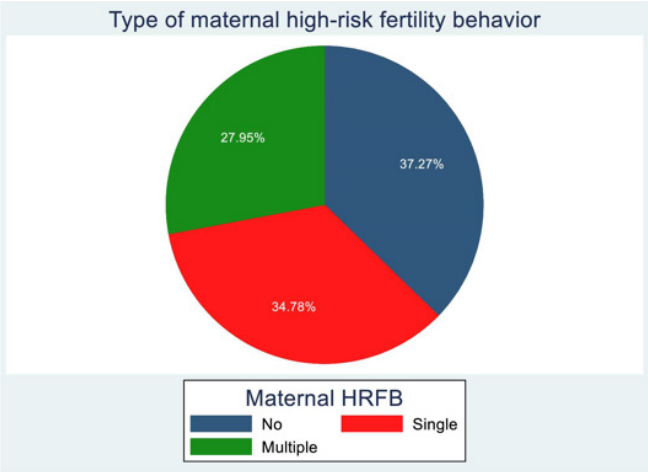

Figure 1 Maternal high-risk fertility behavior among study participants in North Shoa Zone, Central Ethiopia, 2024.

Factors associated with high-risk fertility behavior

In the bivariate analysis, maternal high-risk fertility behavior was significantly associated with maternal education, delivery place, head of household, ANC use, age at marriage, age at first birth, family planning use, PNC use, place of residence, marital status, media exposure, stillbirth history, type of pregnancy, husband education, women autonomy, and multiple pregnancy at a 25% (P-value < 0.25) level of significance. Using those variables, a multivariable binary logistic regression model was built (Table 4).

Maternal education, stillbirth history, index child from multiple pregnancy, pregnancy intention of index child, and women autonomy were significantly and independently associated with the maternal high-risk fertility behavior in the multivariable binary logistic regression model.

Table 4 Bivariate and multivariable binary logistic regression of factors associated with maternal high-risk fertility behavior in North Shoa Zone, Central Ethiopia, 2024

Variables	Categories	HRFB		COR (95% CI)	AOR (95% CI)	*P value*
		Yes	No			
Women education	No formal education	151	28	9.91 (5.73, 17.14)***	4.65 (2.46, 8.78)	0.000
	Primary education	183	117	2.87 (1.85, 4.45)***	2.09 (1.29, 3.38)	0.003
	Secondary or higher	43	79	1	1	
Marital status	Single	45	13	2.20 (1.16, 4.17)*	1.71 (0.81, 3.61)	0.159
	Cohabited	332	211	1	1	
Women autonomy	Non-autonomous	370	51	2.66 (1.89, 3.76)***	1.68 (1.11, 2.55)	0.014
	Autonomous	71	16	1	1	
Age at first birth	Less than 20 years	107	24	3.30 (2.05, 5.33)***	1.70 (0.97, 2.98)	0.061
	20 or higher years	270	200	1		
Stillbirth history	Yes	57	10	3.81 (1.90, 7.63)***	3.20 (1.55, 6.63)	0.002
	No	320	214	1		
Multiple pregnancy	Yes	28	8	2.17 (0.97, 4.84)	3.22 (1.33, 7.80)	0.009
	No	349	216	1	1	
Pregnancy intention	No more	62	8	7.16 (3.33, 15.39)***	2.44 (1.01, 5.87)	0.047
	Later	132	47	2.59 (1.75, 3.84)***	1.50 (0.97, 2.33)	0.069
	Then	183	169	1	1	

Notes: ***, **, * = significant at 0.001, 0.01, and 0.05, respectively.

AOR, adjusted odds ratio; COR, crude odds ratio; CI, confidence interval; HRFB, high-risk fertility behavior

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The odds of high-risk fertility behavior were 4.65 times (AOR = 4.65; 95% CI: 2.46, 8.78; P = 0.001) as high in women not having formal education compared to those who have secondary or higher educational status. Moreover, the odds of high-risk fertility behavior were twice as high in women with primary education compared to those with secondary or higher education (AOR = 2.09; 95% CI: 1.29, 3.38; P = 0.003).

The odds of having HRFB among women who were non-autonomous regarding household decisions were 68% (AOR = 1.68; 95% CI: 1.11, 2.55; P = 0.014) higher compared to women who were autonomous. Likewise, the odds of experiencing high-risk fertility behavior were 2.22 times (AOR = 3.22; 95% CI: 1.33, 7.80; P = 0.009) higher in women whose index child was from multiple pregnancy compared to women whose index child was a product of singleton pregnancy.

The odds of high-risk fertility behavior were 2.44 times as high in women who had unplanned and unwanted pregnancy as compared to women whose pregnancy were planned and desired (AOR = 2.44; 95% CI: 1.01, 5.87; P = 0.047). Similarly, the odds of experiencing high-risk fertility behavior were 3.2 times as high in women with a history of stillbirth compared to women who have no stillbirth history (AOR = 3.20; 95% CI: 1.55, 6.63; P = 0.002) (Figure 2).

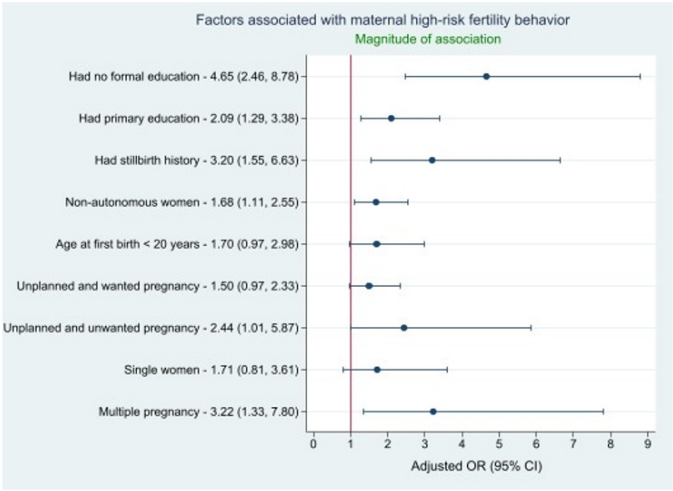

Figure 2 Forest plot of the magnitude of association between the factors associated with the maternal high-risk fertility behavior.

Secondary or higher level of education was the reference group for the educational status variable. Single women were compared to cohabited women. The estimates for each category of the pregnancy intention variable were contrasted with those of respondents whose pregnancy was planned and wanted.

Model diagnostics

The variance inflation factor (VIF) was used to test for multicollinearity, and the results showed that the mean VIF value was 1.39, with the VIF falling between 1.03 and 2.09. Thus, it makes sense to conclude that the independent variables did not have such a high correlation. The Hosmer and Lemeshow test also showed that the model fit the data well (P = 0.1).

Discussion

The study aimed to determine the prevalence of maternal high-risk fertility behavior and the factors that contribute to it. Accordingly, maternal education, stillbirth history, index child being from multiple pregnancy, pregnancy intention of index child, and women autonomy were the variables that were independently linked with the high-risk fertility behavior.

The prevalence of high-risk fertility behavior in this study was found to be 62.7% (58.7, 66.6). This finding is in-line with studies reported from Hadiya Zone, Ethiopia,[9] where the proportion of maternal HRFB was 60.3%. This result is, however, slightly lower than studies conducted in Bangladesh (67.7%),[2] DRC (68.5%),[5] Tanzania (71.55%),[16] Kenya (70.8%),[17] and Ethiopia (72.8%).[18] This might be because these studies used a national data which can approximately represent the true population. In comparison, our study is conducted in the central part of Ethiopia, where the population is somewhat urbanized and have an easy access to family planning services as compared to the periphery.

The high-risk fertility behavior prevalence in our study, however, was significantly higher than that of a study conducted in India,[19] where 35% of women engaged in at least one of these high-risk fertility behaviors. One explanation for this discrepancy may be the Indian study's exclusive emphasis on married women of reproductive age, in contrast to the current study, who are more likely to use contraception since they regularly plan when, how many, and how frequently to have children. Another possible explanation for this discrepancy could be their large sample size (145,270 vs. 601). The prevailing low prevalence of contraception in Ethiopia[20] may again potentially be the cause of this disparity between the Indian and this study.

A birth order greater than three was the most common high-risk fertility behavior in the current study (47.1%). A pooled study of nine east African nations revealed that having a birth order greater than three was the most common high-risk fertility behavior in the region.[6] It is the most common risky behavior in Kenya, where 57.15% of women of reproductive age report having a high birth order.[17] A birth order of more than three is the most prevalent high-risk fertility behavior in Ethiopia.[18] However, it is the second most common high-risk fertility practice in India after a short birth interval.[19] Thus, this implies that reproductive women in Ethiopia had a significant issue of limiting births and contraceptive methods need to be tailored to limit births rather than mere spacing of births.

The educational status of the women showed statistically significant association with the maternal HRFB. The odds of high-risk fertility behavior were 4.65 and 2.09 times as high in women with no formal education and primary education compared to those who have secondary or higher educational status, respectively. This finding is comparable with previous similar studies.[5,11,16,18] A study from DRC using a national data showed that an additional completed year of education decreased the odds of experiencing high-risk fertility behavior by 7.9%.[5] According to a Tanzanian study, women with higher education had a 45% reduced odds of practicing HRFB compared to women with no formal education.[16] A multilevel analysis from Ethiopia using latest mini EDHS 2019 showed that women with secondary and higher education had a 74% lower odds of having HRFB than women who have no education.[11] This could be due to the fact that mothers with a higher level of education tend to be more aware of high-risk fertility behaviors. Engaging in higher education not only helped women to be better informed but also enabled them to prevent too early and too soon childbearing and have improved job opportunities and healthier lives. Furthermore, low levels of education generally lead to lower income and low autonomy, which together limit the women's decision making ability regarding when and how children to have.

This study demonstrated that mothers whose index child is from multiple pregnancy possessed higher HRFB compared to women

whose index child is the product of singleton pregnancy. This might be due to the fact that multiple pregnancy often follows a pregnancy conceived at an advanced maternal age (Age >34 years),[21] making them fall to the high-risk fertility category. Moreover, as the products of pregnancy increases, it is fact that the birth order increases.

According to the results of this study, the odds of experiencing high-risk fertility behavior were 2.44 times as high in women who had unplanned and unwanted pregnancy as compared to women whose pregnancy were planned and desired. This might reflect that women who had experienced unwanted pregnancies had either trouble accessing health services or had poor understanding of contraceptive strategies to improve birth intervals or limit their births. It is clear that one of the purposes of contraceptive use is spacing birth intervals and preventing unwanted pregnancies. This finding is corroborated by studies from Bangladesh,[2] and Ethiopia.[7]

This study showed that having a history of stillbirth was another factor significantly associated with the maternal high-risk fertility behavior. This result is supported by a study conducted in Ethiopia,[3] which found that women who have experienced child loss have a significantly higher chance of being exposed to high-risk fertility.[3] Studies have also shown that stillbirth was more common in women who gave birth at the extremes of age (Age<20 and Age>34 years).[22] Women who have experienced stillbirth may have profound emotional trauma, depression, which may result in reluctance to seek medical advice for her future pregnancies. Moreover, those women may face significant stigma and altered support from the society and the family. This burden may lead women to feel pressured to have another child quickly.

The odds of having HRFB among women who were non-autonomous regarding household decisions were 68% higher compared to women who were autonomous. This is in-line with study conducted in Hadiya Zone, Ethiopia.[9] This is due to the fact that women who are not autonomous often face greater difficulties in deciding when, how frequently, and how much child to raise. This finding is also supported by studies done in Bangladesh[23] and Ghana[24] in which, women with higher decision making power were more inclined to favour having fewer children or low parity and lower risk of fertility behavior compared to their peers with lower decision making power. Some previous studies have also highlighted that, maternal health services and contraception use are more likely to be enhanced in women with strong decision making power.[25] This finding is true in that, reproductive health care services, which are essential for regulating birth spacing and parity, are more likely to be used by women with strong decision-making authority. This could potentially lower the number of high-risk fertility behavior among womens.

Strengths and limitations

Given the size of the sample in our dataset, our results are generalizable to women of reproductive age in the North Shoa Zone. We assessed high-risk fertility behavior using primary data from a rich source, in contrast to previous studies that mostly used secondary data. However, the conclusions drawn are limited to associations because of the study's cross-sectional nature. It was not possible to prove a causal relationship between HRFB and the independent variables. Recall bias may have been introduced, especially when recalling months of birth interval, which is another significant drawback of the study.

Conclusion

The practice of high-risk fertility behavior noted in this study is comparable to previous studies. Women educational status, stillbirth history, index child being from multiple gestation, pregnancy intention of index child, and women autonomy were the factors significantly associated with the high-risk fertility behavior. Programs and interventions on women of reproductive age with a focus on championing women education and enhancing women's decision making abilities are largely recommended. Healthcare providers are urged to give more emphasis to those women who endured stillbirth as they require psychological reassurance, extensive counseling, including their families, and follow-up to reduce the emotional trauma, and ease the pressure they may face from the society.

Implications for policy, practice and research

These findings may help policy makers, development partners, and other relevant institutions develop appropriate intervention programs. Programs and interventions on women of reproductive ages with a focus on advocating women education and improving women's decision making abilities are highly recommended.

Policy makers

Unwanted pregnancies and being non-autonomous are often closely linked to women empowerment. Therefore, it is advisable to empower women in household decisions in order to reduce high-risk fertility behaviors and improve reproductive health outcomes. Moreover, women empowerment through education and economical independency is the most crucial strategy to reduce the high prevalence of HRFB observed in the country as a whole.

Healthcare providers

Healthcare providers should give more emphasis to those women who experienced stillbirth. These women require prolonged psychological reassurance and extensive counseling, including fertility preferences and available family planning methods so as to reduce the emotional trauma, and ease the pressure to have another child quickly. In addition, the partners and the families of those women should receive counseling on the need to back such women.

Future researchers

Future studies capable of determining whether there is a causal link between high-risk fertility behaviors and the above listed factors should be a research priority. Moreover, researchers need to undertake longitudinal studies to comprehend the effects of maternal high-risk fertility behavior on the women, her children and the family as a whole.

Declarations

Ethics approval and consent to participate

The study was reviewed and approved by the Institutional Research Ethical Review Committee of Salale University (SLU-IRECRC). An official letter was sent to each selected Woredas to grant official permission to undertake research activities in all selected kebeles. After informing the study participants of the purpose and procedure, informed verbal consent was obtained from the study participants. The participants were also assured that they had the right to refuse or withdraw if they were not comfortable at any time. This study was performed in line with the principles of the Declaration of Helsinki. The entire data set gathered from the participants was kept confidential by omitting any means of personal identification from the questionnaire.

Consent for publication

Not applicable.

Clinical trial number

Not applicable.

Availability of data and material

The data that support the findings of this study are available upon reasonable request from the corresponding author.

Author contributions

BTO conceived the study, participated in its design and coordination, carried out the statistical analysis, interpreted the results, and wrote the final manuscript, critically reviewing it. HZA, BMZ, and TR participated in the study's design, principal supervision, guided the statistical analysis, and critically reviewed the manuscript. TAG and BB were involved in principal supervision, coordination of the entire study, participated in the interpretation of the data, and critically reviewed the manuscript. The authors have read and approved the final manuscript.

Acknowledgement

The authors are grateful to the Salale University College of Health Science for approving the ethical clearance of this work. The authors also acknowledge the tremendous cooperation of the data collectors and study participants.

Funding

The authors received no funding for this research.

Conflict of interests

The authors declare that they have no competing interests.

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